Formulation and Evaluation of Herbal Gel containing Curry leaves, Amla & Ginger for Seborrheic Dermatitis

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***Abstract*—The current study aims to create and assess a herbal gel containing extracts of curry leaves, amla, and ginger. A gel formulation was made using ethanolic extracts of Murraya koenigii, Phyllanthus emblica, and Zingiber officinale at varying concentrations (1, 2, and 3%). Additionally, evaluated were the gel's topical anti-inflammatory, anti-microbial, antifungal, moisturizing, and healing-promoting properties. Carbopol® 940, extracts, ethanol, propylene glycol 400, glycerine methyl paraben, tri-ethanolamine, and the required quantity of distilled water were used to create the gel. Physical characteristics, pH measurement, spreadability, homogeneity, and viscosity were evaluated for the developed formulations. The results indicated that the appearance and homogeneity of gel compositions were good. The results indicated that the appearance and homogeneity of gel compositions were good.**

***Index Terms*—Curry leaf, Amla, Ginger, Hydrogel, Ethanol, PEG-400, Carbopol-940, Transdermal film, Herbal gel formulation.**

I. INTRODUCTION

Dermatitis: This condition is brought on by inflammation of the skin, which causes redness, swelling, and itching.

DERMATITIS TYPES:

1. Eczema, also known as atopic dermatitis, is a persistent skin disorder marked by dry, irritated, and itchy skin. It is frequently linked to asthma and allergies.
2. Contact Dermatitis: A skin reaction brought on by exposure to an allergen or irritant, such nickel, poison ivy, or specific chemicals.
3. Seborrheic Dermatitis: This skin disorder usually affects the face, ears, and scalp and manifests as a red, flaky, and itchy rash.
4. Stasis Dermatitis: This skin disorder is brought on by an accumulation of fluid in the legs, which results in skin ulcers, swelling, and inflammation.

• Seborrheic dermatitis is a common skin ailment that is straightforward to treat and is not contagious. This kind of dermatitis results in white or yellow crusty or powdery flakes on your scalp, as well as itchy red spots and oily scales on your skin.

• "Derm" means "skin," and "seborrheic" refers to the "sebaceous" glands. It is also known as "cradle cap" when it affects a baby's scalp and "dandruff" (pityriasis capitis) when it affects an adult or adolescents.

Common applications include:

1. Skin care: gels based on amla and glycerine that soothe, moisturize, or treat acne.
2. Pain relief: Gels that contain curry leaves and ginger to lessen muscle soreness or inflammation.
3. Hair care: Gels based on curry leaves, amla, and ginger that encourage hair growth or lessen dandruff.

2.3. Benefits of Herbal Gel

1.Hair and Scalp Benefit

Curry Leaves:

enhances scalp circulation and nourishes hair follicles to encourage hair growth.

Rich in vitamin B and antioxidants, it prevents premature graying and hair loss. makes hair more robust and shinier by strength Amla (Indian gooseberry): Packed with antioxidants and vitamin C, it strengthens hair roots and increases collagen. aids in avoiding scalp infections and dandruff. encourages healthier, shinier, and thicker hair. Ginger: Encourages hair growth by increasing blood flow to the scalp. includes fatty acids, which nourish hair and lessen flakiness or dryness. Because of its antibacterial qualities, the scalp remains healthy and clean.Benefits for the skin (if applied): Ginger's anti-inflammatory qualities help lessen inflammation or acne. Curry

leaves and amla, which are antioxidants, help to keep skin looking young and healthy. Over time, ginger may also lessen blemishes or scars.

3. Overall Advantages:

All-natural, chemical-free sustenance. A cooling gel foundation can provide nutrients and soothe the skin or scalp. Depending on the formulation, it can be used as a gentle face gel, hair mask, or scalp therapy.

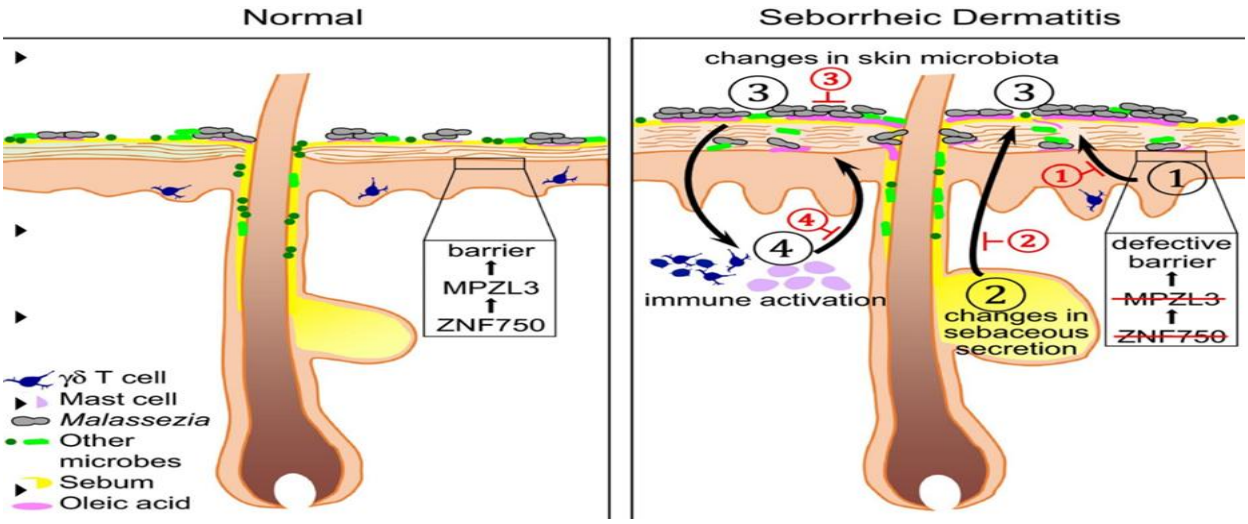


Fig. 1: Mechanism of Action of Seborrheic Dermatitis.

Curry Leaves [10, 12]

Fig. 2(a): Curry leaves

Fig. 2(b): Curry Leaves Powder

Biological Source: *Murrayakoenigii*
Family: *Rutaceae*
Kingdom: Plantae
Subkingdom: Tracheophytus
Division: Angiosperm
Class: Rosids
Order: Sppindales
Genus: Murraya
Species: Koenigii

Amla Powder [11-12]
Biological Source*: Umbelica officinalis gaerth*
Family*: Euphorbiaceae*
Common Name: Indian Gooseberry
Kingdom: Plantae
Subkingdom: Angiosperm
Division: Tracheophytes

Class: Eudicot
Order: Malphigials
Genus: Phallanthus
Species: Emblica

Fig.3(a): Amla

Constituent and uses amla fruits are very high in vitamin C as well as several other antioxidant and nutrients. Compounds and nutrients found in amla fruit
Vitamin A
Vitamin C
Polyphenols
Amino Acids
Proteins
Carbohydrates
Calcium
Potassium
Magnesium
Iron
Carotene
Alkaloid
Gallotannins
Amla is most commonly used to promote hair and scalp health along with that amla has many other uses:-
Reduce premature pigment loss from hair or greying.
Stimulate hair growth.
Reduce hair loss.
Treat dandruff and dry scalp.
Treat parasitic hair and scalp infections like lice infections.
Treat fungal and bacterial hair and scalp infection.

Fig.3(b): Amla Powder

Ginger
Ginger is a monocotyledonous plant belonging to the order Zinziberales.

Kingdom	Plantae
Clade	Monocot
Order	Zingiberales
Family	Zingiberaceae
Genus	Zingiber
Species	Zingiber officinalis

Fig.4: Ginger

PRE-FORMULATION
Method and Materials:

CHEMICALS	AMOUNT
Carbopol-940	1.5 g
Ethanol	300 ml
Glycerine	3 ml
PEG 400	6.25 ml
Curry Leaves	10 g(in 100 ml)
Amla Powder	10 g(in 100 ml)
Ginger Powder	10 g(in 100 ml)
Triethanolamine	Dropwise
Methyl Paraben	0.75 g

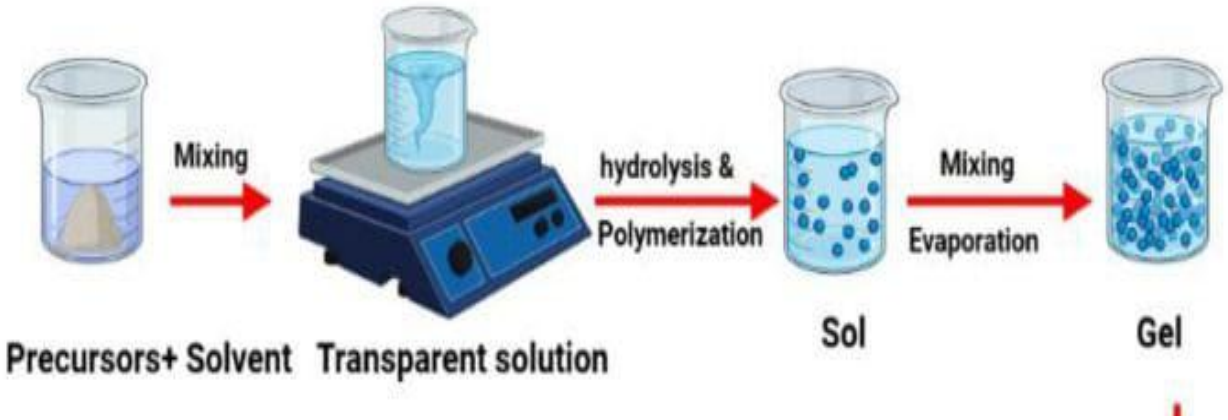
Fig. 5(a): Extraction of Curry Leaves (Soxhlet)

Fig. 5(b): Extraction of Ginger (Soxhlet)

Step-1: weigh 10-20g of each sample and place It in cylindrical filter paper, then put into thimble-shape extraction chamber of soxhlet.
Step-2: Fill 150-200ml Ethanol in solvent reservoir.
Step-3: Attach the solvent reservoir with R.B.F & Condenser.
Step-4: Place it on the Heating mantle for 2-6Hr.
Step-5: After 2-6Hr, Filter the Extract solution through filter paper to remove any remaining sample particle.
Step-6: Heat the solution to remove excess solvent.
Step-7: Dry the concentrated Extract to obtain the powder.
Carbopol base Gel
Weigh 1.5g of Carbopol-940 & dissolve in 100ml distilled water with the help of Magnetic stirrer & set aside for 24Hr.

II. METHODOLOGY

Cold Process Method/ Direct Mixing Method: - It is a technique used for formulating gel where APIs such as Herbal extract, are incorporated into a gel base.



Preparation of method

Weigh the quantity of Methyl paraben, PEG-400 and Glycerine & dissolved in water in a separate beaker.

Then mixed the gelling base of carbopol-940 in another beaker using magnetic stirrer, the mixture was stirred at 100-250 rpm.

Three samples of extraction were prepared of different concentration as per the following ratios and mix with each other at continuous stirring for 1-3 hr.

Then, add drop-wise Triethanolamine for pH Adjustment.

Figure 6: Preparation of gelling base

Figure 7: Formulation 1

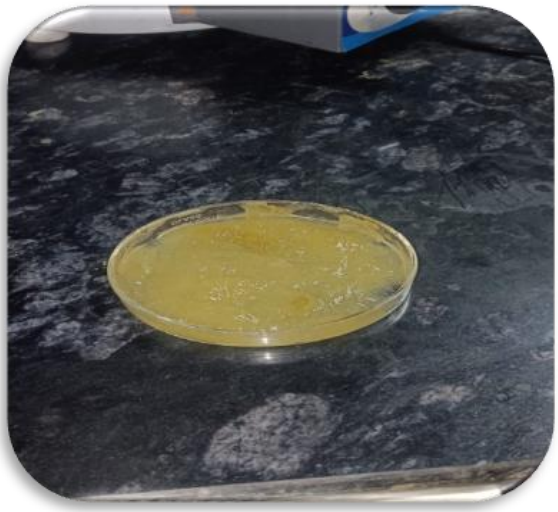


Figure 8: Formulation 2

Table 1: Composition of Gel

FORMULATION	F1	F2	F3	FUNCTION
Curry Leaves Extract	2%	3%	3%	Anti-fungal, Anti-inflammatory.
Amla Extract	3%	2%	3%	Anti-oxidant, Scalp health.
Ginger Extract	1%	2%	2%	Anti-inflammatory, Circulation booster.
Carbopol-940(g)	1.5g	1.5g	1.5g	Gelling Agent
Methyl paraben(mg)	75mg	75mg	75mg	Preservatives
Glycerine(ml)	3ml	3ml	3ml	Moisturizer, Humectant
PEG-400(ml)	6.25ml	6.25ml	6.25ml	Solvent, Enhance penetration
Triethanolamine(ml)	0.5ml	0.5ml	0.5ml	pH Adjuster
Distilled Water	Upto 100ml	Upto 100ml	Upto 100ml	Solvent

III. EVALUATION PARAMETER

Organoleptic Properties: - The gel's texture, colour, and clarity were assessed visually.

Homogeneity: -

Visual inspection demonstrated the homogeneity of all the sophisticated formulas. Their appearance and ability to occupy certain lumps, flocculates, or aggregates were demonstrated. Additionally, the herbal skin gel was qualitatively determined by sifting it between the thumb and forefinger and examining the homogeneity of the sample or the formation of aggregates.

pH measurement: -

Using an automated pH meter, the pH of each skin gel formulation was determined. 1 gram of gel was dissolved in 100 ml of distillation-purified water and left for 2 hours. The pH was recorded after the electrodes were completely submerged in a diluted skin gel formulation. Each output's pH was measured during three intervals, and the average was found.

Spreadability: -

A 20 g load is placed on a glass slide, the gel is fixed between the two slides, the spreadability of the gel is computed, and the time (in seconds) needed to squeeze the sample to a uniform thickness and separate the two slides is also calculated. Spreadability was taken into consideration.

Formula: -

$S = w.l / t$

Where,

S= Spreadability (g.cm/ sec)

w=Weight on upper slide (g)

l = Length of slide (cm)

t = Time taken (sec)

Drug content determination:

By sonicating a known amount of gel in an appropriate solvent, such as ethanol, the drug concentration of the gel is determined. Following an appropriate dilution at the maximum wavelength of the drug, the resultant solution is filtered, and an Ultraviolet-Visible (UV/Vis) spectrophotometer is used to measure absorbance.

IV. RESULT & DISCUSSION

1. ORGANOLEPTIC PROPERTIES OF APIs: -

PROPERTIES	AMLA	CURRY LEAVES	GINGER	CARBOPOL
Colour	Light brownish green to Pale green	Glossy & Dark green	Beige/Light brown	White

Odour	Strong pungent, Earthy aroma (Tangy)	Fragrant, Pungent & Aromatic scent	Strong, Zesty & Spicy fragrance	Acetic odour
Taste	Sour & Tart	Slightly bitter with mild & sharp Herbal Taste	Spicy, Peppery & slightly Sweet Flavor	
Texture	Dry, Fine & slightly grainy	Smooth, slightly Leathery texture	Firm, Fibrous & Juicy	Smooth
Solubility	Ethanol, Water	Ethanol, Water	Partially in Water & 95% in Ethanol	Water, Ethanol

Organoleptic Evaluation: -
Following a transparent presence designed to be smooth on treatment, the colour of all the herbal gel formulations F1, F2, and F3 was determined to be colourless.

PROPERTIES	F1	F2	F3
Colour	Light yellow	Pale yellow	Light yellow
Odour	Characteristics odour	Characteristics odour	Characteristics odour
Texture	Smooth	Smooth	Smooth
Appearance	Translucent	Translucent	Translucent

2. Homogeneity: -
Visual inspection was used to check for lumps, flocculates, and aggregates in order to ensure homogeneity in all of the generated gels. All formulations were found to have high consistency.

S.No.	FORMULATION	HOMOGENEITY
1	F1	Good
2	F2	Good
3	F3	Good

3. pH Determination: -
The pH of all the herbal formulations ranges from 6.92 to 7.02 which is appropriate for the skin & hair compatibility of the herbal gel formulation with the hair.

S.No.	FORMULATION	pH
1	F1	6.93
2	F2	6.95
3	F3	6.97

4. Viscosity Determination: -
Viscosity is a crucial need for differentiating the gels since it affects the drug's spreadability, extrudability, and release. Every formulation had a viscosity that fell between 9361 and 9379 cps.

S.No.	FORMULATION	VISCOSITY (cps)
1	F1	9364
2	F2	9371

3	F3	9374

5. Spreadability

The spreadability is crucial for patient compliance and facilitates consistent gel application. A high-quality gel will have outstanding spreadability and require less time to spread.

S.No.	FORMULATION	SPREADIBILITY (g.cm/sec)
1	F1	13.26
2	F2	12.61
3	F3	10.03

Drug Content determination

Using spectrophotometry at 270 nm, the drug content of the prepared herbal gel was calculated, and the results fell within the permitted ranges.

V. CONCLUSION

In order to treat seborrheic dermatitis, the current study concentrated on creating and assessing a herbal gel that contains extracts of curry leaves, amla, and ginger. Using Carbopol-940 as a gelling agent, three formulations (F1, F2, and F3) were created and assessed for important factors such homogeneity, viscosity, spreadability, pH & organoleptic qualities.

Every formulation exhibited pH values between 6.93 and 6.97, which is within the optimal range for scalp application, and was determined to be smooth, transparent, and homogenous.

Formulation F2 was shown to be the most effective of the three due to its balanced content of active herbal extracts, ideal pH (6.95), and good spreadability (12.61 g.cm/sec), which makes it stable and easy to apply.

F2 has the greatest promise as a natural and efficient treatment for seborrheic dermatitis because of the combined advantages of the herbal ingredients—anti-fungal, anti-inflammatory, antioxidant, and scalp renewing qualities. It is advised to conduct additional research, including microbiological analysis and clinical evaluation, to confirm and broaden its therapeutic application.

REFERENCE

[1] Saini, R., & Purushothaman, J. A Comprehensive Review on the Morphology, Chemistry, and Multifaceted Applications of Curry Leaves.

[2] Verma, A., Patel, P., Singh, D., Singh, A., & Das Kurmi, B. (2024). Curry Leaf: Traditional Herb and its Medicinal Profile, Multipotential Nutraceutical Properties, Phytochemistry, and Pharmacological Activity. Current Functional Foods, 2(2), E260723219130.

[3] Kumar, R., Gupta, S., Kaur, P., & Sahu, S. K. (2024). Exploring the Potential of Curry Leaves for their Therapeutic Action. In BIO Web of Conferences (Vol. 86, p. 01037). EDP Sciences.

[4] Bhadra, P. (2020). A Review on Antimicrobial and Phytochemical Effects of Amla In Skin Care (Anti-Aging). Indian Journal of Natural Sciences, 10(60), 20849-20853.

[5] Fujii, T., Wakaizumi, M., Ikami, T., & Saito, M. (2008). Amla (Emblica officinalis Gaertn.) extract promotes procollagen production and inhibits matrix metalloproteinase-1 in human skin fibroblasts. Journal of ethnopharmacology, 119(1), 53-57.

[6] Hassan, S. M., Mughal, S. S., Aslam, A. S. M. A., Mushtaq, M. A. R. Y. A. M., Munir, M. U. N. E. E. Z. A., Pervez, S. U. M. A. I. R. A., ... & Farman, M. U. H. A. M. M. A. D. (2020). Emblica officinalis (Amla): A prospective review on distinctive properties and therapeutic applications of Amla. Biomed. Nurs, 6, 22-30.

[7] Wilson, R., Haniadka, R., Sandhya, P., Palatty, P. L., & Baliga, M. S. (2012). Ginger (Zingiber

officinale Roscoe) the dietary agent in skin care: A review. Bioactive Dietary Factors and Plant Extracts in Dermatology, 103-111.

[8] Bhagavathula, N., Warner, R. L., DaSilva, M., McClintock, S. D., Barron, A., Aslam, M. N., ... & Varani, J. (2009). A combination of curcumin and ginger extract improves abrasion wound healing in corticosteroid-impaired hairless rat skin. Wound repair and regeneration, 17(3), 360-366.

[9] Ramakrishna S & Gopikrishna U. V (2022). Formulation and Evaluation of Herbal Hair Gel. Sch Int J Tradit Complement Med, 5(2): 28-32.

[10] T Regupathi, K Chitra, K. Ruckmani, KG Lalitha, Mohan Kumar, Formulation and Evaluation of Herbal Hair Gel for Hair Growth Potential. Jof Pharmacol & Clin Res. 2016, 2(2): 555581. DOI 10 19080/JPCR.2017.02.555581

[11] Kumari, P., & Bais, S. (2023). Formulation and Pharmacological Evaluation of Herbal Gel Containing Curcuma Longa. INNOSC Theranostics Pharmacol Sci, 5(1), 1-6.

[12] Jamadar, Mohsin J., and Rajmahammad Husen Shaikh. "Preparation and evaluation of herbal gel formulation." Journal of pharmaceutical research and education 1.2 (2017): 201-24.

[13] Aiyalu, Rajasekaran, Arulkumaran Govindarjan, and Arivukkarasu Ramasamy. "Formulation and evaluation of topical herbal gel for the treatment of arthritis in animal model." Brazilian Journal of Pharmaceutical Sciences 52.03 (2016): 493-507.

[14] Das, Sudipta, Pallab K. Haldar, and Goutam Pramanik. "Formulation and evaluation of herbal gel containing Clerodendron infortunatum leaves extract." International Journal of PharmTech Research 3.1 (2011): 140-143.

[15] Dixit, Gouri, et al. "Formulation and evaluation of polyherbal gel for anti-inflammatory activity." International Journal of Pharmaceutical Sciences and Research 4.3 (2013): 1186.